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(56) Documents Cited

EP 0233742 A2 US 5373984 A US 5096440 A
US 5070604 A US 4515304 A

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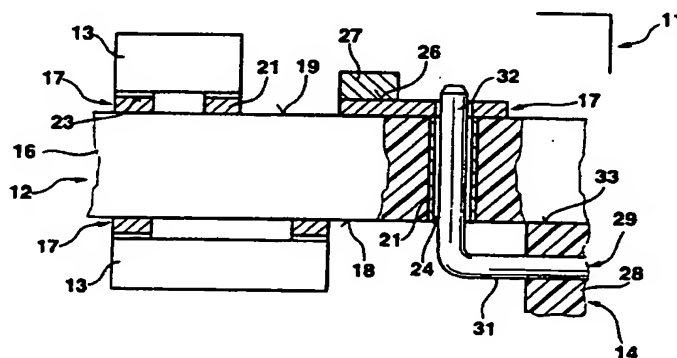
(54) Soldering surface-mounted and lead-in-hole components

(57) An electrical device (11) comprises a printed circuit board (12) which is provided with terminals (17) and is fitted on both, sides with SMD components (13) and also supports a connector bank (14), whose contact elements (29) for reasons of stability are guided according to conventional technology through bores (24) of the printed circuit board (12). The terminals (17) of the printed circuit board (12) which are associated with the contact elements (29) are in each case enlarged by a deposit surface (26), which supports a solder deposit (27), so that the processes of fixing and bonding the connector (14) on the printed circuit board (12) using solder (21), which flows into the bores (24) from the solder deposit (27), can be completed in a single operational step by soldering the components (13) on the printed circuit board (12) by virtue of a reflow soldering process which is conventional in SMD technology.

The connector is also provided (Fig. 2, not shown) with an alignment spigot (34) which is press-fitted into a hole in the circuit board, and a solder tab (37) which is soldered to a terminal on the circuit board for extra stability.

The electrical device (11) is intended preferably for use in motor vehicles.

Fig.1



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DESCRIPTION

ELECTRICAL DEVICE

The invention relates to an electrical device according to the generic type of claim 1. DE 33 10 477 A1 discloses a generic type electrical device. This device comprises a printed circuit board fitted with electrical components and a contact bank on which are mounted the contact elements. The printed circuit board comprises bores through which from a front side of the printed circuit board the terminal wires of the components and the terminal portions of the contact elements are guided and are soldered using a wave soldering device on the rear side of the printed circuit board provided with conductor tracks, in that the rear side of the printed circuit board is drawn over a soldering bath disposed in a strip-like manner and thus comes into contact with liquid solder.

Thus in a disadvantageous way it is not possible to fit the rear side of the printed circuit board with components so that in the case of predetermined outer dimensions of the device it is not possible to expand the function thereof in a way which requires an increase in electrical components and contact elements of the contact banks.

In addition the described methods of fitting components to the printed circuit board and therefore the production costs of the device are cost intensive.

Advantages of the invention

In contrast thereto the electrical device in accordance with the invention comprising the characterising features of claim 1 has the advantage that the aforementioned inadequacies are avoided to a satisfactory degree. The printed circuit board is formed for SMD technology for the purpose of attaching surface-mountable components. This renders it possible to mount these components on both sides of the printed circuit board, wherein for the purpose of preliminary fixing the components are adhered to terminals of the printed circuit board provided with solder and then are soldered by application of heat only. Since no bores and no threading through of terminal wires are required, the manufacturing costs are reduced as a result of shorter assembly times for the printed circuit board than in the prior art.

The terminal portions of the contact elements of the contact bank, which are also guided through bores of the printed circuit board for reasons of stability, are surrounded by terminals of the printed circuit board which comprise in each case a solder deposit on additional deposit surfaces so that these terminal portions of the contact elements are soldered in the same soldering process as the components and are thus supplied with solder from the solder deposit. This saves a separate soldering process for the terminal elements of the contact bank and contributes to cost effective production of the electrical device.

By means of the features set out in the sub claims

advantageous developments of the electrical device stated in claim 1 are possible.

Drawing

An exemplified embodiment of the invention is illustrated in the drawing and explained in detail in the description hereinafter.

Figure 1 shows a partial sectional view of the printed circuit board having electrical components and a terminal element of the contact bank and Figure 2 also shows a partial sectional view of the printed circuit board and contact bank having centring means and a holding element.

Description of the exemplified embodiment

An electrical device 11, in particular a switch and control device for a motor vehicle, comprises as essential components according to Figure 1 a printed circuit board 12, which is fitted with electrical components 13, and a contact bank 14, by way of which the device 11 can be connected to other components of the motor vehicle.

The printed circuit board 12 is formed for SMD technology. To this end thick layers of solder 21 are applied in the form of a paste and in an adhesive manner on to a basic body 16, which consists of an electric insulating material, in the screen-printing process as planar terminals 17 on a front side 18 and a rear side 19 of the basic body 16. Electrical components 22, comprising tin-plated contact surfaces 23 formed thereon for the purpose of preliminary fixing, are adhered to the terminals 17.

Furthermore, the printed circuit board 12 comprises bores 24 which are disposed in series and connect the front side 18 to the rear side 19. The wall of each one of the bores 24 is lined with thin layers of solder 21. On the rear side 19 of the basic body 16 the bores 24 issue into terminals 17, which in each case are enlarged by a deposit surface 26 for a solder deposit 27.

The contact bank 14 consists of an insulating material body 28, in which a plurality of contact elements 29 are embedded in a sealed manner. The contact elements 29 which are disposed in series comprise in each case a contact portion [not illustrated in further detail] and an angled terminal portion 31. During the assembly of the contact bank 14 on the printed circuit board 12 the angled end piece of the terminal portion 31 is guided through the associated bore 24 and protrudes with its free end 32 into the terminal 17 which is enlarged by the deposit surface 26.

As shown in Figure 2, centring means 34 in the form of spigots protrude at a base 33 of the contact bank 14 which is facing the printed circuit board 12 which centring means engage into associated recesses 36 and form a clamp pressing fit when the contact bank 14 is placed in the correct position on to the front side 18 of the basic body 16 of the printed circuit board 12. Thereby the contact bank 14 is fixed in a preliminary manner on the printed circuit board 12. In this position holding elements 37, which can be soldered, which consist of metal

elbows and which on the one end can be anchored in the insulating body 28 and on the other end protrude tin-plated laterally out of the contact bank 14, flush with the base 33, move into position at the terminals 17.

The printed circuit board 12 assembled in this manner is subjected, with the rear side 14 directed upwards, to heat treatment, which melts the solder 21, in a reflow oven which is equipped with a red light lamp, so that soldered connections of the terminals 17 are produced with the contact surfaces 23 of the components 22 and with the holding elements 37 of the contact bank 14. Simultaneously liquefaction of the solder deposits 27 occurs whose solder 21 flows to the free ends 32 of the terminal portions 31 and into the bores 24, to form soldered connections between the respective terminal 17 and the associated terminal portion 31 of the contact elements 29. The contact bank 14 is secured in a particularly stable manner on the printed circuit board 12 by virtue of the anchoring of the substances themselves of the terminal portions 31 of the contact elements 29 in the bores 24 and by virtue of additionally fixing the insulating material body 28 to terminals 17 of the printed circuit board 12 by way of the holding elements 37.

In this manner an electrical device 11 is produced which comprises high packing density for a large scope of function by virtue of a printed circuit board 12 which is fitted on both sides with components 13. In a manner which is favourable to manufacturing engineering the

components 13 are attached in SMD technology and although the contact bank 14, whose contact elements 29 for reasons of stability are still guided according to conventional technology through bores 24 of the printed circuit board 12, only a single soldering process, which is tailored to suit SMD technology, is required in the production of the printed circuit board. [sic]

CLAIMS

1. Electrical device, in particular a switch and control device for motor vehicles, in which at least one printed circuit board, which is fitted with electrical components, and at least one contact bank are contained, which contact bank comprises contact elements having in each case a terminal portion, which terminal portions can be passed through bores, which in each case connect a front side to a rear side of the printed circuit board, and can be soldered on the rear side to terminals of the printed circuit board, characterised in that the printed circuit board is formed for SMD technology for the purpose of attaching surface mounted components and comprises on the front side and the rear side as terminals terminal fields which are provided with solder and on which terminals on the one hand the components are adhered to contact surfaces and which terminals, whilst surrounding the bores on the rear side, on the other hand are enlarged here in each case by virtue of an additional deposit surface for a solder deposit, and in the event of heat treatment, which melts the solder, on the one hand solder the contact surfaces of the components to the terminals lying opposite and on the other hand the solder flows from the solder deposit into the associated bore, connects with the substance itself the respective terminal portion to the associated terminal by virtue of a soldered connection, and fixes the contact bank on the printed circuit board.

2. Electrical device according to claim 1, characterised in that centring means are provided on the contact bank and, when the contact bank is placed in the correct position on to the front side of the printed circuit board, engage into associated recesses of the printed circuit board with a clamp pressing fit for the purpose of preliminary fixing the contact bank on the printed circuit board.

3. Electrical device according to claim 2, characterised in that holding elements, which can be soldered, are attached to the contact bank and said holding elements in the case of a contact bank which is fixed in a preliminary manner on the printed circuit board lie on terminals of the printed circuit board and subsequent to heat treatment which melts the solder fix the contact bank on the printed circuit board.

4. An electrical device substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.



The
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Application No: GB 9625027.9
Claims searched: 1-4

Examiner: Steven Davies
Date of search: 14 February 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.O): H1R-RAB, RBW ; H2E-EDCN229, EEKE163, EEKEZ, EEKH163, EEKHZ

Int CI (Ed.6): H05K-1/18, 3/30, 3/34

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
Y	EP 0233742 A2	(E.I.DU PONT) e.g. col.3, line 40-col.4, line 5	2
X,Y	US 5373984	(WENTWORTH) e.g. col.5, lines 4-65	X: 1 Y: 2,3
Y	US 5096440	(KATSUMATA) e.g. col.2, line 63 <i>et seq</i>	3
X,Y	US 5070604	(BANBA <i>et al</i>) the whole document	X: 1 Y: 2,3
X,Y	US 4515304	(BERGER) the whole document	X: 1 Y: 2,3

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.

& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.

Fig.1

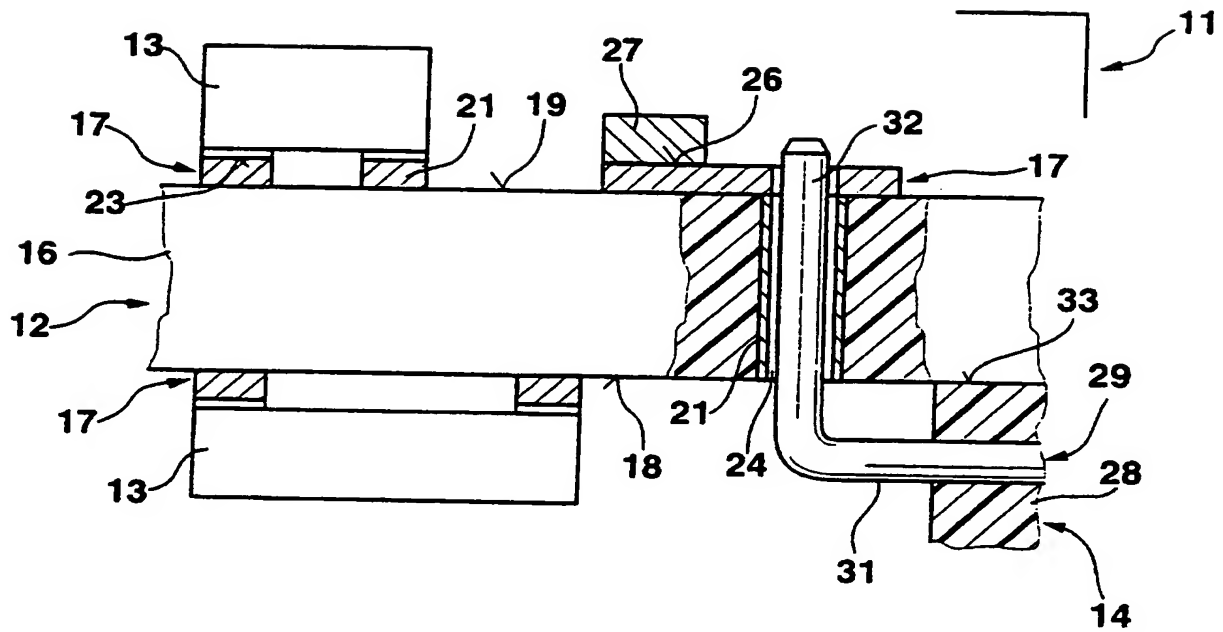


Fig.2

